The epidemiology of regional and widespread musculoskeletal pain versus urban settings in those ≥55years

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THE EPIDEMIOLOGY OF REGIONAL AND WIDESPREAD MUSCULOSKELETAL PAIN IN RURAL VERSUS URBAN SETTINGS

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ABSTRACT

Objectives

To examine whether there are differences in the prevalence of regional and chronic widespread pain in areas of different rurality; and to examine risk factors any pain conditions that are found to be in excess in rural areas.

Methods

Participants, aged ≥55 years from participating general practices in seven different geographical locations in Scotland were sent a questionnaire. The one-month prevalence of ten regional pain conditions and chronic widespread pain (CWP) was identified using body manikins. Differences in the prevalence of pain with differing rurality were examined using simple descriptive statistics. Thereafter, among the rural population, the relationships between pain and putative risk factors were examined using Poisson regression. Thus, results are described as relative risks.

Results

The prevalence of CWP was found to increase with increasing rurality, whereas no differences were observed with any other pain conditions that were examined. Factors associated with the reporting of CWP included general health, feeling calm all of the time, and selected measures of social contact. Factors independently associated with CWP included: female gender (1.24; 0.997-1.55), poor self-rated health (3.50; 1.92-6.39), and low mood (1.54; 1.07-2.20). Also, having fewer than ten people to turn to in a crisis was associated with a decrease in the risk of CWP: 0.68 (0.50-0.93) and 0.78 (0.60-1.02) for those with 5-10 and <5 people, respectively.

Conclusions

Generally, the prevalence of regional pain(s) is similar in urban and rural settings. However, the prevalence of CWP increases with increasing rurality. Risk factors for CWP in rural populations include, not only

general health, and markers of mental health, but also aspects of social contact. Social networks may be more difficult to maintain in rural settings and clinicians should be aware of the negative effect of perceived social isolation on pain in rural settings.

INTRODUCTION

Musculoskeletal pain is common, particularly in the low back, hip, knee and shoulder[1], and it is associated with considerable disability, healthcare and societal costs[2]. Estimates vary, but for low back pain, the most common regional pain condition, one-year prevalence has been estimated to be approximately 30-40% while lifetime prevalence is 65-70%[3]. Similarly, population studies consistently show the prevalence of chronic widespread pain – the cardinal feature of fibromyalgia – to be around 12%[1].

The majority of epidemiological studies of pain have considered urban or sub-urban populations with little work in communities that are rural (small population size) or remote (distance from large towns)[4]. Some authors have described elevated levels of chronic pain in a Swedish rural population[5] and a rural versus urban area of the United States[4]. However, there were no significant differences in prevalence between individual pain sites. A further study found high pain prevalence in a Canadian population with a disproportionately high number of rural participants[6]. However, work in this area is limited: sample sizes and response rates are low[4;6] and the extent to which samples are rural is not always clear[5].

The essential difference between rural and urban populations, in terms of healthcare, is the relative accessibility to services, but there may also be differences with regard to aetiology. Risk factors for pain in the general population include female gender, poor psychological well-being, lower social class, occupational and psychosocial factors[1-3;7;8]. Further, studies have found that in those with chronic pain higher quality of life was related to lower social constraints, suggesting benefits of strong social support networks[4], and these may be easier to maintain in urban rather than rural communities. There are however, reasons to believe that aetiology may be different between urban and rural settings. Generally speaking, rural populations have higher levels of manual labour (and individuals remaining in physical occupations later in life[9], an older population and higher levels of social isolation, with the dispersal of social groupings leading to distinct social interaction effects[9]. Some have suggested that individuals living

in socially isolated environments are more likely to focus attention inward, and are at increased risk of reporting physical symptoms[10].

The aim of the current study was to examine the epidemiology of regional and widespread pain in rural versus urban settings. In particular, we aimed firstly: to compare prevalence of regional and widespread pain in areas of differing rurality; and, secondly, to determine the risk markers for any pains that appear to be in excess in rural populations.

METHODS

Over 95% of persons resident in the United Kingdom are registered with a General Practice therefore this represents a suitable population sampling frame for epidemiological studies. All persons aged ≥55 years on the registers of nine participating general practices were sent a questionnaire by post to collect data on pain, general health and wellbeing. Non-respondents were sent a further questionnaire after two weeks.

Rural sample

The rural sample came from practices participating in the Older People for Older People (O4O) study. Funded by the EU Northern Periphery Programme (2007-2010), the O4O study aimed to improve services delivered to the population living in remote and rural areas, working with communities in Scotland, Finland, Sweden, Greenland and Northern Ireland (www.o4os.eu). Only practices from Scotland were selected for the current study and the sample comprised six rural communities within the Scottish Highlands – an area of low population density, with fewer than 100 people per square kilometre.

Urban sample

The urban sample came from three practices participating in the MUSICIAN study. The MUSICIAN study was a 2x2 factorial randomised controlled trial investigating the management of chronic widespread pain, the methods of which have been described elsewhere[11;12]. Identification of potential participants was by means of a large-scale postal questionnaire survey which collected data in a manner identical to that used in the rural study. Only practices in Aberdeen were selected for the current study. The city of Aberdeen in the north-east coast of Scotland has a population of 250,000 and is a relatively affluent city with high employment particularly in the fields of oil, higher education and fishing.

Questionnaires

Study questionnaires gathered information on demographics (age; gender; location; employment), and pain was assessed by asking the participants; "Thinking back over the past month, have you had any aches or pains that have lasted for one day or longer?" Participants answering positively were then asked to shade the location(s) of their pain on a four-view body manikin; this was coded into regional areas as per Figure 1. The following regional pain conditions were identified: shoulder pain; elbow pain; forearm pain; hand pain; low back pain; hip pain; knee pain; foot pain; headache and chronic widespread pain (defined according to the 1990 American College of Rheumatology criteria for fibromyalgia i.e. pain lasting more than 3 months, on both sides of the body, above and below the waist, and axial pain[13].

<<Figure 1 here>>

Rural study participants were also asked about a number of putative risk markers for pain, including self-rated health and information on social and psychosocial factors (knowing or trusting neighbours, attendance / participation at community projects and local groups; recently speaking to or seeing friends, neighbours and family; people to turn to in a crisis; feeling calm; feeling downhearted). Attendance at social groups was defined as "yes" if any positive answer was provided for recent attendance, partaking in, or being an active member of community events. A composite index of social contact was created using the number of times participants saw their friends, neighbours and relatives, and a separate index for number of times participants spoke to friends, neighbours and relatives. Each was then divided into quintiles for analysis.

Analysis

Differences in the prevalence of pain across differing levels of rurality (i.e. areas of decreasing population size), compared to the urban population, were examined using the Chi2 test for trend. Thereafter, for pain conditions shown to be in excess in rural areas, the relationship between pain and potential risk markers

was examined using Poisson regression. Thus, results are presented as risk ratios with 95% confidence intervals, the latter being derived using robust estimates of standard error[14]. Estimates from univariate analyses were initially adjusted for age, sex and location, then used to build a multivariable model in which variables were offered to the model if the adjusted risk ratio was ≥1.25 (or its reciprocal, ≤0.8) or if it was significant at p≤0.2. These criteria were applied for dichotomous variables or for any category of categorical variables and ensured that all potential confounding factors of even marginal significance were considered for the final model. The final multivariable Poisson regression models used forward stepwise modelling, with variables included at p=0.10 and eliminated at p=0.15. Factors which were likely to be consequences of pain as opposed to potential risk markers (e.g. pain interference with social life) were not considered for multivariable analysis. All analysis was conducted using Stata v12.1 (StataCorp LP, College Station, Texas).

RESULTS

Demographic characteristics of the study sample

In total, questionnaires were sent to 12,831 people. From rural areas 1374 / 2462 responded and provided complete data on pain (56%), and 4639 / 10,369 from urban areas (45%). The characteristics of both study populations are detailed in Table 1.

<<Table 1 here>>

Prevalence of regional and widespread pain

The prevalence of pain in urban and rural areas was 65.8% and 64.6% respectively. There was no difference in the overall pain prevalence with increasing rurality across the seven sites (Chi2trend: 1.35; p=0.25). The most common regional pain conditions in both populations were low back pain, hip pain, knee pain and shoulder pain. Figure 2 shows the prevalence of all pain conditions by increasing rurality and, further, provides a Chi2 test for trend to investigate significant differences in pain prevalence. Only for chronic widespread pain (CWP) was there a significant trend in the prevalence of pain with increasing rurality (Chi2trend: 6.70; p=0.009), although the magnitude of the difference in prevalence across categories was relatively small (17.4% in the urban sample, versus 22.2% in the most rural sample).

<<Figure 2 here>>

Risk markers for CWP in the rural population

The prevalence of CWP in the rural population was 21.0%. Women were significantly more likely to report CWP than men (risk ratio: 1.30; 95%CI: 1.05-1.60). Persons who were retired were more likely to report

CWP (1.54; 1.12-2.11) and there was some evidence (albeit of borderline significance) that those aged ≥85yrs were more likely to reported CWP compared to those aged 55-64yrs (1.45; 0.97-2.15) (Table 2).

<<Table 2 here>>

A dose-risk relationship was found between self-rated health and CWP (Table 3), those reporting poor self-rated health had a five-fold increase in the reporting of CWP (4.99; 2.83-8.81) compared to those who reported excellent health. Participants who knew or trusted few or none of their neighbours were more likely to report CWP (1.50; 1.15-1.95 and 1.40; 1.08-1.81 respectively). There was also some evidence that those rarely saw friends, family or neighbours were at increased risk (1.33; 0.98-1.81) although, interestingly, individuals living in two-person (0.60; 0.45-0.80) or single person households (0.78; 0.56-1.08) were less likely to report CWP than those living in households of more than two people.)

Those reporting low mood – as indicated by feeling downhearted – experienced a significantly elevated risk of CWP (2.4; 1.7-3.3). The same was true of those who reported that they rarely felt calm (2.8; 2.0-4.2).

Contrary to what one might have expected, compared to participants who reported that they have more than ten people they could turn to in a crisis, those with fewer confidants reported a reduction in the risk of CWP (0.72; 0.52-0.99 and 0.89; 0.67-1.18 for those with 5-10 and <5 people, respectively).

<<Table 3 here>>

Multivariable analysis

On multivariable analysis, three factors emerged as independent risk markers for CWP: poor self-rated health, low mood, and the number of people one has to turn to in a crisis (Table 4). Although forced into

the model, and therefore not subject to the stepwise variable selection criteria, female gender also significantly predicted CWP occurrence in the final model.

<<Table 4 here>>

DISCUSSION

We have demonstrated that, for the main part, the prevalence of pain is similar in urban / rural communities. However, we provide some evidence to suggest that CWP occurs in excess in rural populations. Further, we have shown some evidence to suggest that, in a rural population, individuals who know few of their neighbours, or who rarely see friends / family / neighbours are at increased risk of CWP.

A number of methodological issues must be considered when interpreting these findings. Firstly, the response rate for the rural and urban populations was 56% and 45%, respectively, and non-response bias is a potential concern. This may occur where those who do / do not participate are systematically different with respect to the conditions or relationships under investigation. Age and sex are known markers of participation, with non-responders more likely to be male and younger. However, in the current study, the whole sample was ≥55 years and therefore the effect will be reduced. No data is available on non-responders in the rural sample due to restrictions on access to non-respondent data. With an older and more female population, this may have influenced the prevalence results as both of these factors are associated with an increased risk of pain. However, were the increased prevalence with increasing rurality of CWP due to non-response bias, one would also expect an increased prevalence of all pain(s); this was not observed.

Secondly, there is the possibility of duplicates in the rural dataset. Following initial postage of the survey (Feb 2009), a reminder was sent to the entire sample (April 2009) requesting a response from those who had not yet replied. This ensured participation remained anonymous although, technically, it was possible for people to respond twice. Potential duplicates were identified on SPSS (PASW Statistics Release Version 18.0.0) by comparing variables unlikely to change between mailings, such as age; gender; employment status; qualifications; income; number of people in household; etc. This identified 69 potential duplicates, which were removed from further analyses. Therefore, some participants may have who should not have been excluded, and / or some individuals included twice. Two sensitivity analyses were concluded: firstly,

pain prevalence was estimated in the entire dataset (i.e. potential duplicates included); and secondly, we estimated the prevalence of all included pain conditions using bootstrap methodology. One thousand estimates of prevalence were computed (for each pain condition) each time removing a random sample of 69 individuals in order to match the original 'duplicate' numbers. Both approaches resulted in almost identical estimates of pain prevalence. We believe, therefore, that our findings have not been biased to any great extent by the administrative issue in the rural study.

Thirdly, the cross-sectional nature of the analysis prevents us from establishing temporality, and one must be wary of reverse causality in drawing conclusions. For example, stronger effects are observed with the perception of social contact and community rather than any objective markers of this, and it may be that pain influences one's perception of these relationships and that these 'risk factors' are in fact consequences of pain, rather than antecedents of it. It is crucial, therefore, that further studies examine these relationships longitudinally.

And finally, we made eleven comparisons of pain prevalence by rurality (any pain; nine regional pains; and CWP) and only in the latter was a significant association observed. Notwithstanding the fact that even 1 in 11 is below the commonly accepted (5%) threshold, we cannot rule out the possibility that the single association with CWP may have arisen by chance. However, although the magnitude of effect was not large, the relationship between rurality and CWP was far from statistically borderline, at p=0.009. In other words, the probability of observing the trend we see in the data if, in reality, the null hypothesis is true (i.e. that there is no association) is less than 1%.

Previous work examining rural populations have reported low response rates (25%) and often no definition of rurality is given[4;5;10]. The current study is the first, to our knowledge, to examine the epidemiology of pain in a UK rural community while also directly comparing pain prevalence to a similar urban population. The prevalence of rural regional pain reported here is consistent with urban populations[15], further, the finding that low back, knee, shoulder and hip are the most common regional pains across both populations

is in line with urban literature[1;4;15]. Urban population estimates of CWP have been fairly consistent ranging between 11-14%[1]. However, more recent evidence reported prevalence of 23% and incidence of 9%[16] in an urban sample. This recent evidence and the current CWP prevalence reported for the urban and rural sample (17%, 21% respectively) may reflect a shift over time with increasing CWP, or it may be that previous literature has underestimated its burden.

CONCLUSIONS

The current study only investigated the aetiology of those pain conditions which were found to increase significantly with increasing rurality. The method was chosen due to a number of reasons, there are a high number of comparisons within this study, and one way to guard against the effects thereof multiple testing is to cut down the number of comparisons. Additional analysis was conducted to determine whether aetiology greatly differed for all other regional pain conditions. In general, the risk factors for CWP in the current study were very similar to those previously reported for CWP[1]. Further, the current findings suggest that, in a rural population, individuals who know few of their neighbours, or who rarely see friends / family / neighbours are at increased risk of CWP. This is consistent with other studies that have shown that a better sense of neighbourhood is associated with better physical and mental health, lower stress, better social support and being physically active[17], and we have previously shown in older adults living in an urban setting that perceived loneliness is a risk factor for musculoskeletal pain[18].

Our results suggest that individuals who knew and / or trusted few of their neighbours were more likely to report CWP. This provides support for Pennebaker who claimed that those who live in socially isolated environments may be at greater risk of reporting physical symptoms due to a lack of external distractions[10] and it is certainly conceivable that the benefits of social networks are harder to realise in remote and rural communities. Social isolation may also limit access to treatments, and without support from neighbours, older rural residents may have greater difficulty reaching health / social care.

An intriguing finding was that participants who reported fewer than 10 people to whom they could turn in a crisis experienced a decrease in the likelihood of CWP. Initially counter-intuitive, one can only speculate on the mechanism underpinning this association. However, it may be that it is the perception of the quality of these relationships that is important rather than the quantity.

In summary, there is currently little research looking at the epidemiology of pain in rural communities and there are no direct comparisons of pain prevalence with an urban population. We have shown that, while the prevalence of regional pain conditions is similar, the prevalence of CWP significantly increases with increasing rurality. Further, while our findings need to be corroborated with longitudinal investigations, we have demonstrated that while a number of aspects of the aetiology of CWP in rural populations are similar to those reported in urban settings, not all objective measures of social contact are associated with pain prevalence. However, there is a negative effect of perceived social isolation. Those who know / trust their neighbours are less likely to report CWP, providing evidence for the benefit of a strong neighbourhood community and the perceived quality of these relationships. While this is important for the maintenance of musculoskeletal health generally, it is of particular importance in rural areas where individuals are more likely to be physically and socially isolated.

MANUSCRIPT INFORMATION

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Ethical approval

The MUSICIAN study obtained ethical approval from the Cheshire NHS Research Ethics Committee. The O4O study and its Rural Communities Health and Wellbeing Questionnaire was approved by the North of Scotland NHS Research Ethics Committees.

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Author contributions

- RED Conducted the analysis and produced first draft of the manuscript.
- MB Data collection (MUSICIAN study). Commented on manuscript.
- AS Data collection (O4O study). Commented on manuscript.
- EJ Data collection (MUSICIAN study). Commented on manuscript.
- CG Data collection (MUSICIAN study). Commented on manuscript.
- JF Chief investigator (O4O study). Commented on manuscript.
- GJM Chief investigator (MUSICIAN study). Commented on manuscript.
- GTJ Supervised analysis and drafting of manuscript.

Conflicts of interest

The authors declare that they have no competing interests.

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FIGURES

Figure 1 – Manikin indicating regional pain areas

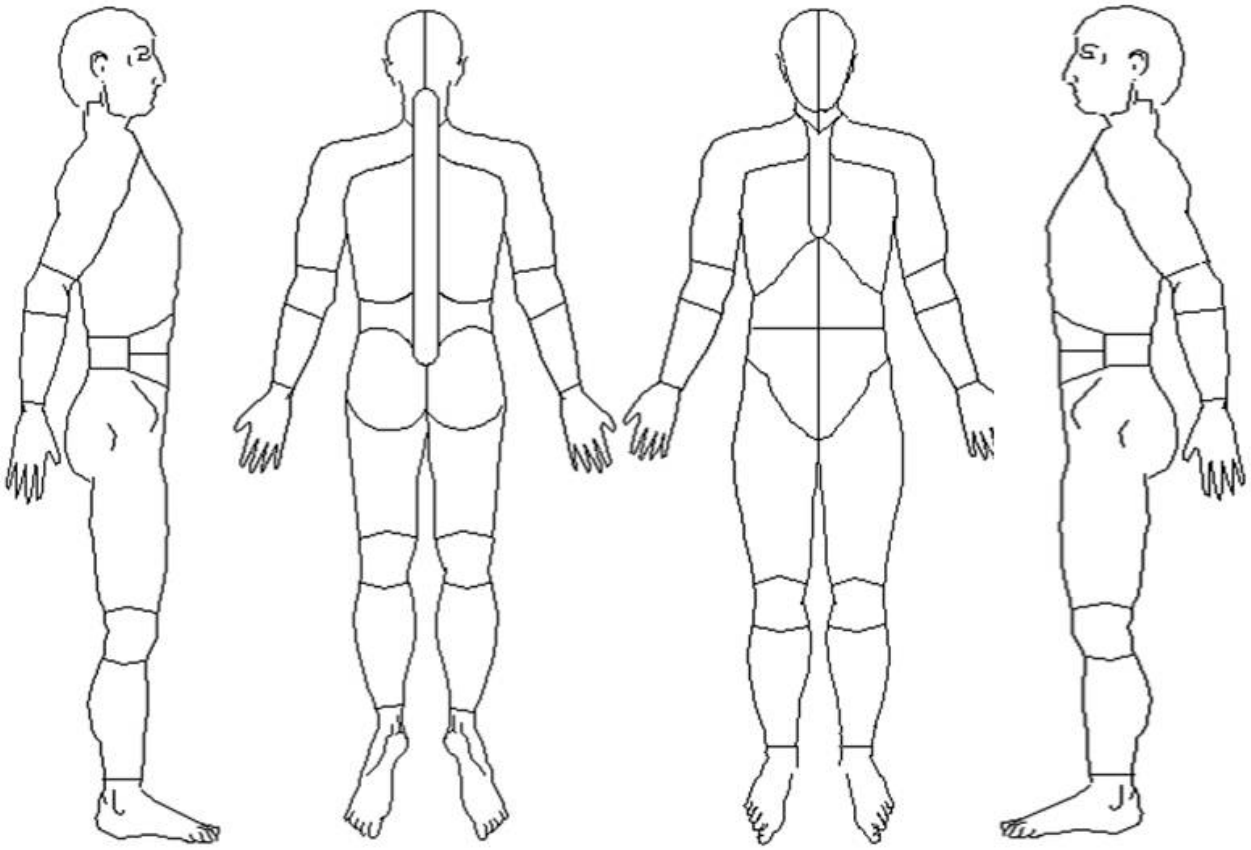
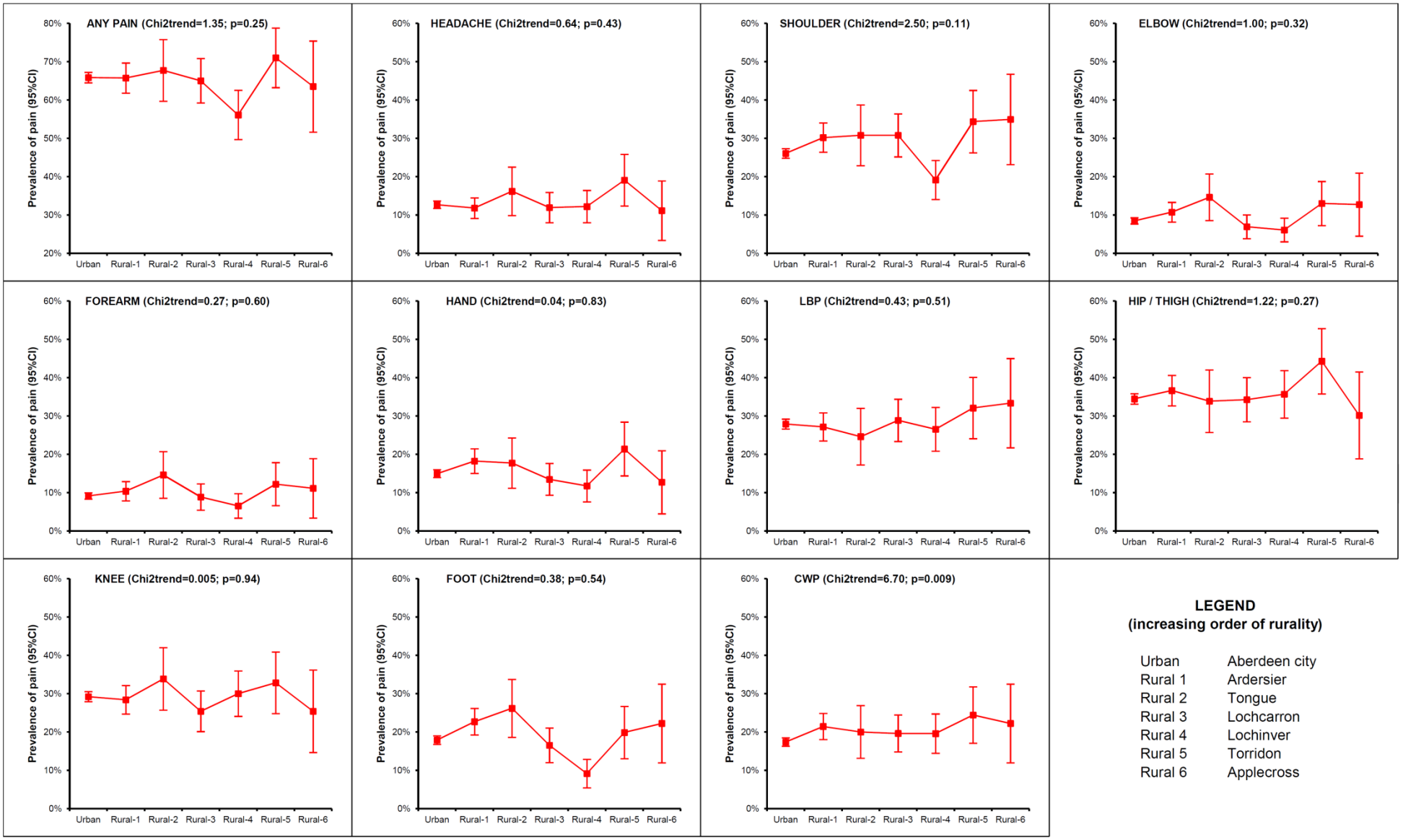


Figure 2 – Prevalence of regional and widespread pain conditions with increasing rurality



TABLES

Table 1 – Characteristics of study populations

		Rural* n (%)	Urban* n (%)
Age	55-64yrs	620 (45.5%)	1890 (40.7%)
	65-74yrs	408 (29.9%)	1479 (31.9%)
	75-84yrs	270 (19.8%)	1019 (22.0%)
	>84yrs	66 (4.8%)	251 (5.4%)
Sex	Male	630 (46.3%)	2073 (44.7%)
	Female	731 (53.7%)	2566 (55.3%)
Employment	Full-time	264 (20%)	895 (19%)
	Part-time	153 (11%)	471 (10%)
	Retired	900 (67%)	2704 (58%)
	Unemployed	32 (2%)	11 (0.2%)
	Unable to work	–	193 (4%)
	Other	–	273 (6.2%)
Location**	Urban	–	4639 (100%)
	Ardersier (1000;23mins)	560 (40.8%)	–
	Tongue (1000;123mins)	130 (9.5%)	–
	Lochcarron (950;87mins)	260 (18.9%)	–
	Lochinver (600;122mins)	230 (16.7%)	–
	Torridon (400;88mins)	131 (9.5%)	–
	Applecross (250;118mins)	63 (4.6%)	

* Numbers vary due to missing data.

** Numbers in parentheses denote (i) population size (indication of the extent to which the community is rural) and (ii) drive time to a community of >10,000 (indication of the extent to which the community is remote).

Table 2 – Association between chronic widespread pain and demographic factors, in rural population

		Chronic widespread pain*		Risk ratio
		Yes	No	(95%CI)
Age	55-64yrs	130 (21.0%)	490	1.00
	65-74yrs	86 (21.1%)	322	1.01 (0.79-1.28)
	75-84yrs	48 (17.8%)	222	0.85 (0.63-1.14)
	>84yrs	20 (30.3%)	46	1.45 (0.97-2.15)
Sex	Male	113 (17.9%)	517	1.00
	Female	170 (23.3%)	561	1.30 (1.05-1.60)
Employment	Full-time	38 (14.4%)	226	1.00
	Part-time	33 (21.6%)	120	1.50 (0.98-2.28)
	Retired	199 (22.1%)	701	1.54 (1.12-2.11)
	Unemployed	7 (21.9%)	25	1.52 (0.74-3.12)
Education**	H-grade or higher	143 (19.6%)	585	1.00
	S-grade or below	134 (22.8%)	455	1.16 (0.94-1.43)

* Numbers vary due to missing data.

** H-grade = Scottish 'Higher' grade exams, typically taken at age 17-18yrs. S-grade = Scottish 'Standard' grade exams, typically taken at age 15-16yrs.

Table 3 – Association between chronic widespread pain and health, social and psychosocial factors, in rural population

		Chronic widespread pain*		Risk ratio**
		Yes	No	(95%CI)
Self-rated health	Excellent	16 (9.7%)	149	1.00
	Very good	57 (12.3%)	405	1.32 (0.76-2.28)
	Good	98 (21.4%)	361	2.26 (1.34-3.80)
	Fair	83 (38.6%)	132	4.23 (2.5-7.16)
	Poor	34 (48.6%)	36	4.99 (2.83-8.81)
Number of people in household	>2 people	46 (28.6%)	115	1.00
	2 people	146 (18.1%)	672	0.60 (0.45-0.80)
	1 person	89 (23.5%)	289	0.78 (0.56-1.08)
Know neighbours	Most	107 (17.9%)	490	1.00
	Many	98 (21.1%)	367	1.20 (0.93-1.54)
	A few / None	82 (26.7%)	225	1.50 (1.15-1.95)
Trust neighbours	Most	149 (19.0%)	635	1.00
	Many	66 (20.4%)	258	1.12 (0.86-1.47)
	A few / None	72 (27.9%)	186	1.40 (1.08-1.81)
Recent social group attendance	Yes	166 (19.6%)	683	1.00
	No	120 (23.4%)	393	1.12 (0.89-1.40)
See friends / family / neighbours	Regularly	71 (18.9%)	305	1.00
	Often	61 (19.4%)	253	1.05 (0.77-1.45)
	Sometimes	62 (20.1%)	247	1.07 (0.78-1.48)
	Rarely	66 (24.4%)	205	1.33 (0.98-1.81)
Speak to friends / family / neighbours	Regularly	87 (23.8%)	278	1.00
	Often	63 (17.6%)	294	0.76 (0.56-1.03)
	Sometimes	65 (20.9%)	246	0.91 (0.68-1.23)
	Rarely	53 (21.3%)	196	0.98 (0.71-1.34)
Number of people to turn to in a crisis	>10	54 (24.3%)	168	1.00
	5-10	68 (17.7%)	317	0.72 (0.52-0.99)
	<5	151 (23.1%)	503	0.89 (0.67-1.18)
Feeling calm	All of the time	27 (11.5%)	207	1.00
	Most of the time	167 (19.7%)	679	1.74 (1.18-2.56)
	Little or none of the time	88 (33.2%)	177	2.98 (1.99-4.45)
Feeling downhearted	None of the time	84 (13.4%)	541	1.00
	A little of the time	158 (26.1%)	447	1.88 (1.47-2.4)
	Most or all of the time	41 (33.3%)	82	2.27 (1.61-3.2)

* Numbers vary due to missing data.

** Adjusted for age, sex, employment status, educational qualifications and geographical location.

Table 4 – Factors independently associated with chronic widespread pain in rural population (multivariable model)

		Risk ratio* (95%CI)
Sex	Male	1.00
	Female	1.24 (0.997-1.55)
Self-rated health	Excellent	1.00
	Very good	1.13 (0.65-1.95)
	Good	1.91 (1.13-3.23)
	Fair	3.33 (1.93-5.73)
	Poor	3.50 (1.92-6.39)
Feeling downhearted	None of the time	1.00
	A little of the time	1.50 (1.15-1.94)
	Most or all of the time	1.54 (1.07-2.20)
Number of people to turn to in a crisis	>10	1.00
	5-10	0.68 (0.50-0.93)
	<5	0.78 (0.60-1.02)

* Adjusted for age, employment status, educational qualifications and geographical location which were forced into model.